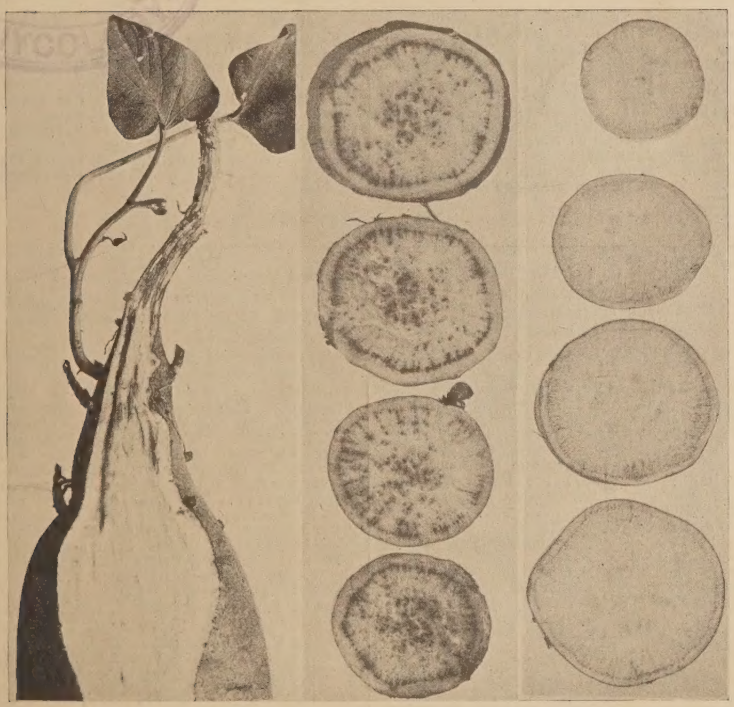
AUGUST, 1924 BULLETIN 401

# The Stem Rot of Sweet Potatoes

## Losses, Sources of Infection and Control

R. F. POOLE



LEFT—INFECTED SPROUT ON DISEASED POTATO
CENTER—DISCOLORED TISSUE DUE TO STEM ROT
RIGHT—HEALTHY SWEET POTATO

NEW JERSEY
AGRICULTURAL EXPERIMENT STATIONS

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# The Stem Rot of Sweet Potatoes

## Losses, Sources of Infection and Control

R. F. Poole, Ph.D.

In New Jersey, the stem-rot disease *Fusarium hyperoxysporium* and *F. batatatis Wr.* of sweet potatoes (*Ipomoea batatatis*) has long been of economic importance. In some areas, and on the same soils, the disease has caused heavy loss in some seasons and slight loss in others. On severely infected soils the loss has been serious in both wet and dry seasons, but greater in dry seasons.

In previous investigations of the disease, in which much time was given to studying the sources of infection, it was found that the soil was the most serious source. In order to control the disease, then, it was necessary to find some practical method of soil treatment or to develop resistant varieties. Since as yet no satisfactory soil treatment has been discovered, control measures must be based on growing resistant varieties.

The purpose of this bulletin is to present the results of studies to determine the relative resistance of different strains and varieties of sweet potatoes to the stem rot disease on different soil types in the state.

TABLE 1

The Prevalence of Stem Rot and Its Effect Upon the Yield of Sweet Potatoes

| Year | Infested fields | Infected plants in infested field | Reduction in yield | Average yield per acre | Total yield for the state |
|---|---|---|---|---|---|
| | *per cent* | *per cent* | *per cent* | *bu.* | *bu.* |
| 1921 ..... | 95 | 30 | 20 | 143 | 1,890,000 |
| 1922 ..... | 95 | 30 | 20 | 173 | 3,600,000 |
| 1923 ..... | 95 | 40 | 30 | 118 | 2,500,000 |

### Importance and Losses

Some idea of the prevalence and loss due to stem rot disease in New Jersey may be had from an inspection of table 1, which presents estimates based on field observations made during July and August, and in October when the potatoes were harvested. The results show that the percentage of reduction in yield due to stem rot was the same in 1921 and 1922, but was 10 per cent higher in 1923. Although the percentage of reduction due to the disease was estimated to be the same in 1921 and 1922, there was an average production of 30 bushels per acre more in 1922 than in 1921. The results indicate that other diseases and seasonal conditions had something to do with the variation in yields for the two years. In 1923 it was estimated that stem rot caused a greater loss than in the two previous years,

which is indicated by the higher percentage of reduction in yield and the lower average yield per acre.

The economic importance of the disease is further shown by its prevalence and destruction in some of the special sweet-potato growing localities. The results of observations made from August 1 to 20, in 1922 and 1923, are given in table 2. One or more fields of the Yellow Jersey variety were inspected in each locality.

TABLE 2

Observations on stem-rot infection of sweet potatoes on one or more farms in several localities, August 1 to 20

| Locality | County | Stem-rot infection 1922 | Stem-rot infection 1923 |
|---|---|---|---|
| | | *per cent* | *per cent* |
| Pedricktown | Salem | 14.6 | 27.5 |
| Penns Grove | Salem | 25.0 | 26.2 |
| Bridgeton | Cumberland | 1.5 | 15.0 |
| Vineland | Cumberland | 9.6 | 38.3 |
| Haddonfield | Camden | 35.0 | 30.0 |
| Blue Anchor | Camden | 21.5 | 62.0 |
| Swedesboro | Gloucester | 29.3 | 30.3 |
| Center Square | Gloucester | 30.0 | 25.2 |
| Mickleton | Gloucester | 25.0 | 63.3 |
| Thorofare | Gloucester | 29.0 | 23.7 |
| Clarksboro | Gloucester | 50.0 | 39.2 |
| Riverton | Burlington | 88.0 | 36.3 |
| Moorestown | Burlington | 18.0 | 45.2 |
| Mount Holly | Burlington | 8.0 | 36.3 |
| Pleasantville | Atlantic | 5.1 | 5.0 |
| Beuna | Atlantic | 4.5 | 6.0 |
| Keyport | Monmouth | ... | 11.6 |

The greatest injury to the crop was observed in Burlington, Camden and Gloucester counties, although the infection was serious on some farms in other counties. The results indicate that there was much variation in the amount of infection in each county and also in different localities, sometimes a difference of 75 per cent occurring on adjacent farms. While frequently the disease caused more damage in some parts of the field than in others, the infection and kill in the majority of the fields was uniform throughout (fig. 1).

In fields where the plants are killed by stem rot in June, resets are made in time to produce a fair crop, though the resets generally are not so good in all cases as the first sets. In fields where the stem-rot kill is high in July and August, making it too late for resetting, crab-grass developed in the vacant spaces and caused heavy loss (fig. 2). In fields where there was only a slight kill or none at all, the density of vines and foliage prevented the development of grass and weeds. In some fields, the plants continued to die throughout the season. It was not economical

to reset all these hills because settings made late in the season are not very productive of marketable potatoes.

In seasons when the rainfall was between 3 and 4 inches each month, and distributed quite evenly during May, June, and July, it was easy to reset and produce and maintain a good stand of sweet-potato vines, which soon grew strong and somewhat resistant to stem rot. But when the rainfall was below 3 inches each month and unevenly distributed during the months named, it was with difficulty that good stands were obtained with the first resets. In a great many cases the plants were watered in the field two or more times to keep them alive. Under dry conditions, however,

FIG. 1. LATE IN SEPTEMBER, A FIELD OF SWEET POTATOES SHOWING MORE THAN 85 PER CENT LOSS DUE TO STEM ROT

the plants were stunted, becoming very susceptible to stem rot, and consequently many plants died soon after they were reset in the field.

Infection may take place at any time from June 1 to October 30, which is the growing season in this state. Plants that became infected in September or later generally produced a crop that was nearly normal, while earlier infections sometimes resulted in a total loss. Some plants infected in August produced small potatoes, but not of marketable size. If small potatoes had already been formed before the plants were killed they produced sometimes many sprouts in the hill, which were killed by either the disease or frost.

## Stem Rot of Sweet Potatoes in Other States

Stem rot has been reported from nearly every state where sweet potatoes are grown. It has caused most serious damage in states where the Jersey varieties and strains are most common, but has also been serious in Mississippi, North Carolina and Tennessee, where the Nancy Hall variety is grown extensively. In many of the southern states, only a trace of the disease has been observed. The variation in the percentage of infection, as reported from the different states in Plant Disease Survey bulletins in 1919, 1920, 1921, 1922 and 1923, is probably due either to variation in soil infection in the different states, or to the growing of resistant varieties in some localities and susceptible varieties in others, or to both these factors.

Fig. 2. After Stem Rot Had Caused More Than 50 Per Cent Loss, a Sweet Potato Field Infested with Crab-Grass.

## Sources of Infection

In New Jersey there are three possible sources of stem-rot infection; the seed potatoes and sprouts, the plant-bed, and the field. It is apparent, that in case the seed is the important source of infection, the disease could be controlled by selecting seed potatoes from healthy vines. Also in case the plant-bed and the field are severely infected, other means than seed selection must be devised for the control of the disease.

In this state, on the average farm, the seed potato is not a serious source of infection. On nearly every farm there are some areas in the fields where the potatoes are not severely attacked by stem rot. On most

farms, seed potatoes have been selected from the least infected areas, or by splitting the vines and saving for seed only potatoes from healthy stems and vines. In following out this practice, healthy seed has been obtained by a majority of the growers. However, on farms where seed potatoes are obtained from severely infected areas, without careful selection, the seed is sometimes a serious source of infection.

In order to determine the percentage of stem-rot infection of sprouts grown from diseased potatoes, a bushel each of Yellow Jersey and Red Jersey potatoes were gathered from hills that were killed by stem rot. A bushel each of the same varieties of potatoes were selected from hills where the vines were slightly infected but not killed. A similar quantity of each variety was selected from healthy vines. In April the potatoes were bedded

TABLE 3

The average percentage of stem-rot infection of sprouts grown on potatoes selected from killed, slightly infected and healthy sweet-potato vines

| Variety | Source | Stem-Rot Infection | |
|---|---|---|---|
| | | Sprouts in Pots | Sprouts in Field |
| | | *per cent* | *per cent* |
| Red Jersey ..... | Killed plants | 52 | 60 |
| Yellow Jersey ... | Killed plants | 35 | 33 |
| Red Jersey ..... | Slightly infected plants | 9 | 11 |
| Yellow Jersey ... | Slightly infected plants | 7 | 5 |
| Red Jersey ..... | Healthy plants | 0 | 0 |
| Yellow Jersey ... | Healthy plants | 0 | 0 |

without disinfection, in clean sand, in a greenhouse bed. The sand was maintained moist to the hand, while the temperature was allowed to vary, rising above 85 degrees around noon on some days. Under these conditions the sprouts were ready for examination in six weeks. They were grown sufficiently large for replanting in the field, but not allowed to grow runners. The sprouts were drawn and the stems split into quarters the entire length of the plant and examined. A microscopic examination of cross-sections of some of the sprouts was made, but even where infection was slight, this was unnecessary, since the diseased discolored tissue was detected by the naked eye. Altogether 300 of the first sprouts were examined. Also 100 sprouts were drawn from each lot of potatoes and planted in a field where sweet potatoes had never been grown before. In both of the tests the results (table 3) were very much the same. They indicate that potatoes used for growing sprouts when obtained from seriously infected vines will produce a high percentage of diseased sprouts; when obtained from slightly infected plants, they will produce a low percentage of dis-

eased sprouts, while seed obtained from healthy vines will produce nothing but healthy sprouts.

These results suggested that similar tests be conducted with sweet potatoes selected from bins on farms, where there was only slight infection or none at all in the field, and also where there was severe field infection. For this test, two lots of seed were selected; one in Atlantic county, the other in Gloucester. The potatoes used had been grown in fields where the stem-rot infection was less than 3 per cent and more than 30 per cent, respectively.

The potatoes selected in Atlantic County showed less than 1 per cent infection of the sprouts grown. When the potatoes were split open only a trace of stem rot was found in a few potatoes of the bushel tested. Of the bushel of potatoes selected from the field having 30 per cent of the plants infected, 65 per cent of the sprouts showed no signs of stem rot, 30 per cent were slightly infected and 5 per cent were severely infected. These results indicate that good seed can be obtained from bins and other storage containers when the potatoes are grown in fields where there is no, or only slight, stem-rot infection. They indicate also that stem rot in sprouts produced on sweet potatoes from highly infected fields will vary somewhat according to the percentage of infection in the field, but always will be high.

### Tests Conducted with Sweet Potatoes Selected from Healthy Vines

In order to determine the value of healthy seed in reducing stem rot on the severely infected areas and also to determine to what extent the field soil is a source of infection, potatoes were selected from healthy and productive hills on farms in Gloucester County at Swedesboro in 1919. The potatoes were bedded in a clean sand plant-bed, and the sprouts divided into lots of 500 or more, and distributed to five farms, located near Repaupa, Mickleton, Swedesboro and New Brunswick. In 1920 and 1921 the same experiments were continued, the results of which have already been published (6). The results in 1922 and 1923 were very similar to those obtained in 1920 and 1921, which showed that the percentage of stem-rot infection was higher on some soils than on others, and that certified seed slightly reduced the loss due to stem rot.

In 1923 the Jersey Selection 102, grown by William Liepe, and the Jersey Selection 106, grown by Keinzle Bros., all of Atlantic County, were obtained for further tests. The seed from both sources was healthy. The potatoes were bedded in localities near the experimental farms so that the sprouts could be transplanted to the field the same day they were drawn from the plant-bed. The sprouts were set on seven farms between June 1 and 20. The vines on the experimental plots were examined for

the percentage of stem rot during the summer, and at digging time in October, with the results given in table 4. At the College Farm, on soil that had not been planted to sweet potatoes before, there was no stem-rot infection or kill of either strain. On some soils, while infection and kill were slight, on others they were extremely high. These tests show also that the only way to prevent the spread of the disease to uninfected soils is to use healthy seed and sprouts.

TABLE 4

The results of testing healthy sweet potatoes on seven farms in six counties

| Locality | Jersey Selection 102 | | Jersey Selection 106 | |
|---|---|---|---|---|
| | Infection | Kill | Infection | Kill |
| College Farm .... | 0 | 0 | 0 | 0 |
| Pleasantville ..... | 8.6 | 5.0 | 8.2 | 4.0 |
| Berlin ..... | 33.8 | 12.9 | 32.9 | 11.8 |
| Moorestown ..... | 85.4 | 30.3 | 39.3 | 18.3 |
| Riverton ..... | 83.0 | 35.1 | 55.0 | 20.1 |
| Swedesboro ..... | 85.3 | 51.1 | 52.1 | 22.2 |
| Vineland ..... | 100.0 | 62.2 | 61.1 | 28.1 |

## Cuttings from Healthy Vines not Resistant to Stem Rot

On some farms in the Carolinas and other southern states, vine cuttings, as well as sprouts, have been used for a long time. To start a sweet potato patch, growers frequently buy sprouts, which, after a few weeks' growth in the field, develop vines of various lengths. From these vines, they are able to make many cuttings for resetting and enlarging the patch. In making cuttings, terminal branches are preferred; however, two nodes taken anywhere on the vine are sometimes used. The method of setting the cuttings is similar to that employed in setting sprouts. The cuttings are set so that one node of the terminal end is above ground for a top, while the other is in the ground for root development. Partly or completely covered nodes on any part of the vine develop roots quickly.

The vine cuttings are sometimes preferred to sprouts because they can be obtained from healthy vines. The growing season is shorter in New Jersey than in the South, so that cuttings set here are not so productive as in the Carolinas and farther south. In 1923 cuttings from selection 102 were tested on infected, virgin, and sterilized soils in pots in the greenhouse and in the field. In the infected soil in the greenhouse, the cuttings were 100 per cent diseased. In the field, 62 per cent of the plants were infected and 41 per cent were killed by the disease. In pots in the greenhouse and in the field, none of the plants grown in both virgin and sterilized soils was diseased. The results of these tests indicate that

healthy cuttings might aid in preventing a rapid spread of the Fusaria to virgin soils. Where soils are severely infected, the healthy cuttings do not offer any better means of reducing losses from stem rot than do healthy sprouts grown from healthy seed. It is not always easy, however, to obtain healthy sprouts, since in many plant-beds they are developed under conditions favorable for infection.

### Varietal Relation to Stem-Rot Infection

After finding that the soils were the greatest source of infection, it was planned to study the relation of the varieties to disease resistance, and later to study soil treatment. Although some method of soil treatment may be devised for a practical control of the disease, it does not seem likely, since other workers were not able to control other species of Fusaria by treating the soil with various substances. In the investigation of cabbage yellows by Jones and his associates (4), cotton wilt by Orton (5), and tomato wilt by Edgerton (1), the results of soil treatments were without any practical effect. However, these workers were able to control the respective diseases, all due to species of Fusaria, by developing resistant varieties. Their results suggested that varietal resistance might bring the quickest relief to the sweet-potato growers of this state.

In the study of varietal resistance, most of the important commercial varieties, obtained from various sources were tested on infected soils. It has already been shown by Harter and Field (2), and the author (6), that some of the varieties, grown farther south, and sometimes improperly called Yams, are more resistant to stem rot than the Jersey varieties, but further tests were necessary on a number of infected soils to determine their relative resistance and production value. It was also important to know something about the adaptability of the varieties in this state, particularly with reference to their mode of growth on different soil types. A resistant variety is considered successful when it produces a larger yield of potatoes of uniform size and marketable quality than do the susceptible varieties on infected soils, since fair yields of the Jersey varieties are sometimes obtained on infected soils even where the stem-rot kill is 20 per cent or more.

In addition to the different varieties, a number of selected strains of the most promising varieties were tested. There are a number so-called sport strains of the Jersey varieties which open up an unlimited field of study to determine both their relation to each other and their resistance to stem rot. The sport strains differ sometimes in size of vine and foliage, and in shape, size and color of the potatoes. The Vineless Yellow Jersey, for example, has vines about 2 feet long at maturity, which develop by short nodes, while the leaves and potatoes are very similar to those produced on the Yellow Jersey which grows vines 10 feet or more long.

Sometimes some of the vines of this strain revert to the long vine form. For growers who continue to use the Jersey strains on infected soils, information bearing on the degree of susceptibility or resistance of these strains is important as a guide for selecting the strongest.

Varieties for this work were obtained from various sources. The Nancy Hall was obtained from Professor Johnson of the Virginia Truck Station, Professor Beattie of the Bureau of Plant Industry, and G. P. Hoffman of South Carolina. The Porto Rico was obtained from the first two sources and from Gid Hellams of South Carolina. The Triumph was obtained from Professor Beattie, and from Professor Starcher of the Alabama Experiment Station. All others except the native Jersey varieties, were obtained from Professor Beattie. The Jersey strains and varieties were selected on different farms in the state.

For growing the sprouts these potatoes were placed in flue-heated hotbeds, in some cases on the same farm where the experiment was conducted and in others in localities where the plants could be easily distributed to the experimental farms. The average dates of handling the crop were: potatoes bedded April 10, sprouts planted June 1, and potatoes harvested October 15.

Of each variety 100 to 2200 plants were set on five farms in as many counties, the number of sprouts of each variety being uniform. The results obtained from 100 plants on uniformly infected areas checked very closely with those where larger numbers were used. The plants were inspected in July, in August and at digging time; each time the plants infected and those killed by stem rot in each variety, were counted. At digging time, the yield of marketable stock was determined and the stems were split and examined to obtain the total percentage of infection. In cases where plants were killed by other causes than disease, the misses were not used in estimating the infection or kill due to stem rot.

Tests were conducted on farms in Atlantic, Burlington, Camden, Cumberland and Gloucester counties. The soils ranged from deep sand to gravelly sand. It was easy to obtain a uniformly infected area on any of the farms where the tests were conducted, and the most susceptible Yellow Jersey strain was used as a check on the uniformity. In the following discussion, each variety is first treated separately, and later all the varieties are compared.

### The Nancy Hall Variety

The Nancy Hall (fig. 3) was tested on nine farms in 1922, and on six farms in 1923. The results of the tests are given in table 5. They show that the variety is very susceptible to stem rot. The infection varied from none to 69.6 per cent, according to the variation in soil infection. On the College Farm there was no infection of any of the varieties tested, which would indicate that the soil is not infected. The percentage of stem-rot kill was quite high on some farms. In the

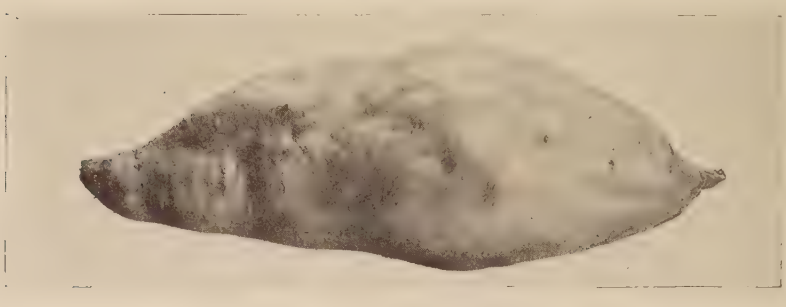

Fig. 3. Nancy Hall.

wet season of 1922, the production was much larger than in the dry season of 1923. On some farms, it appears from the results obtained that there was little or no reduction in yield, although the percentage of stem rot was very high. It is possible, however, that the yield would have been much greater on those particular soils, had there been no loss from stem rot.

In the hot-air and manure plant-beds, the Nancy Hall potatoes produced many sprouts, large and well rooted, but were not very resistant to drought when set in the field. On deep sandy soils this variety rooted deeply and a large percentage of the potatoes were of the "jumbo" size. On gravelly sandy soils and on light sandy soils with a shallow clay subsoil, the potatoes were uniform in size and shape, the latter types producing very few "jumbo" potatoes. In this state the variety is grown on a few areas for the early market. Early in the season, on local markets, the raw potatoes of the Nancy Hall variety sold equally well with any other variety. By planting late in May, or around June 1, some growers are able to dig a profitable crop in August and September. On soils where the stem rot has not been serious, this variety is a good producer. The vine growth is short and bushy, and cultivation is easy. When baked, the potatoes are moist and sweet.

TABLE 5

Some Results of Testing the Nancy Hall Sweet Potato

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Marlton ..... | 17.1 | .... | 16.2 | .... | 229 | .... |
| Moorestown .. | 69.6 | 22.1 | 13.9 | 12.7 | 325 | 169 |
| Blue Anchor .. | 37.4 | .... | 27.4 | .... | 344 | .... |
| Vineland ..... | 40.0 | 38.0 | 25.0 | 22.0 | 389 | 181 |
| Wolfert ..... | 52.0 | .... | 25.0 | .... | 115 | .... |
| Swedesboro ... | 15.0 | .... | 7.6 | .... | .... | .... |
| Repaupa ..... | 50.3 | .... | 10.3 | .... | 238 | .... |
| Pleasantville .. | 10.0 | 6.2 | 2.0 | 3.2 | 440 | 125 |
| Berlin ..... | .... | 27.8 | .... | 23.6 | .... | 176 |
| Riverton ..... | .... | 38.1 | .... | 25.6 | .... | 233 |
| College Farm.. | 0 | 0 | 0 | 0 | 311 | 367 |

FIG. 4. PORTO RICO

### The Porto Rico Variety

The Porto Rico (fig. 4) was tested on nine farms in 1922 and on six farms in 1923. The results in table 6 show that the variety is very susceptible to stem rot. The infection varied from none to 65.7 per cent, according to the variation in soil infection. The plants killed amounted to more than 20 per cent of the hills on six farms. The large variation in yield, from 85 to 475 bushels per acre, indicates that the variety is not equally adapted to all soils. While on some farms the stem rot must have reduced the crop a great deal there were rather high yields even where the disease had killed more than 20 per cent of the plants.

In view of these results the Porto Rico does not appear to be a promising variety to grow on stem-rot infected soils. The percentage of stem rot of this variety was more serious in the early part of the season than in the late summer. Besides being susceptible to stem rot, the potatoes sometimes sprouted poorly, and were not sufficiently rooted to resist drought. In deep sandy soils it sometimes produces a poor grade of potatoes; very often the predominating size is the "jumbo" and the potatoes root deeply, making the crop very difficult to harvest.

TABLE 6

Some Results of Testing the Porto Rico Sweet Potato

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Marlton ..... | 18.0 | .... | 7.2 | .... | 114 | .... |
| Moorestown .. | 40.3 | 45.1 | 10.3 | 28.8 | 125 | 136 |
| Blue Anchor .. | 50.7 | .... | 20.7 | .... | 305 | .... |
| Vineland ..... | 20.0 | 60.0 | 18.2 | 26.3 | 350 | 155 |
| Wolfert ..... | 65.7 | .... | 45.0 | .... | 85 | .... |
| Swedesboro ... | 7.2 | .... | 2.3 | .... | .... | .... |
| Repaupa ..... | 35.6 | .... | 5.6 | .... | 133 | .... |
| Pleasantville .. | 10.2 | 18.1 | .5 | 5.2 | 425 | 110 |
| Berlin ..... | .... | 30.1 | .... | 21.5 | .... | 138 |
| Riverton ..... | .... | 38.1 | .... | 26.5 | .... | 233 |
| College Farm.. | 0 | 0 | 0 | 0 | 233 | 361 |

In fertile gravelly sand and sandy soils with a shallow clay subsoil the variety is very productive, the potatoes being smaller and more uniform in shape and size than those produced on the deep sandy soils. Also, on these types the potatoes were formed nearer the surface and the center of the hill than on the deep sandy soils. On some fertile loamy soils the Porto Rico also produced well, generally much better than the Jersey varieties. In this state there is a small area planted to the Porto Rico variety to supply local demands for the moist type of potato.

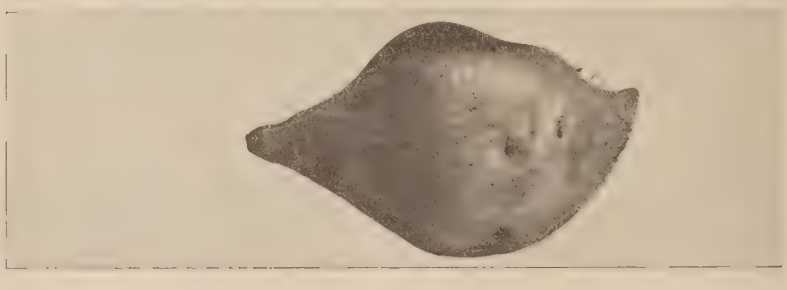

Fig. 5. Dooley

**The Dooley Variety**

The Dooley (fig. 5) was tested on five farms in 1922 and in 1923. The results presented in table 7 show that the variety is slightly resistant to stem rot. Even on the severely infected soils the highest infection was 35.3 per cent, while the highest kill was only 17.2 per cent. The results also show that there was a variation in the percentage of soil infection on the different farms. The production of salable stock varied from 85 to 492 bushels per acre. Since the percentage of stem-rot infection and kill was generally low, it is apparent that the difference in yield was due to the influence of soil type and seasonal conditions rather than to stem rot.

On deep sandy soils, production was very poor; the potatoes were long, rough, sometimes large and of irregular size and shape. Gravelly sandy soils gave very good production and the potatoes were round, chunky and of uniform size and shape. On slightly infected, or not infected, gravelly sandy soils, the Dooley variety may be quite profitable, especially if there is a local demand for the moist type of potatoes.

In the hot-air plant-beds, the Dooley sweet potatoes sprouted poorly. The average yield of sprouts from five plant-beds at the first pulling was 195 per bushel of potatoes used, in comparison to 2,000 or more from the same quantity of Yellow Jersey potatoes. In the greenhouse on the College Farm, the yield of sprouts was 350 per bushel—slightly better than the average given above. The condition of the potatoes in all tests was excellent. It appears that the yield of sprouts from Dooley potatoes is likely to be irregular and unsatisfactory in the average plant-bed on New Jersey farms.

There is another characteristic of the Dooley, which some growers may not like. It is one of the highest colored so-called Yam sweet potatoes. When baked, the flesh is orange to brown, moist and sweet. Most growers prefer to grow the yellow-flesh dry and firm type.

TABLE 7

Some Results of Testing the Dooley Sweet Potato

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Marlton ..... | 12.8 | .... | 4.9 | .... | 85 | .... |
| Moorestown .. | 1.3 | 35.3 | 1.3 | 12.0 | 212 | 113 |
| Blue Anchor .. | 1.9 | .... | 0 | .... | 492 | .... |
| Vineland ..... | 0 | 17.0 | 0 | 3.5 | 307 | 254 |
| Berlin ..... | .... | 32.5 | .... | 17.2 | .... | 111 |
| College Farm . | 0 | 0 | 0 | 0 | 259 | 361 |
| Riverton ..... | .... | 29.3 | .... | 16.0 | .... | 162 |

**The Pumpkin Variety**

The Pumpkin was tested on five farms in 1922 and in 1923. Table 8 shows that the variety is slightly resistant to stem rot. The infection and kill in the wet season was low in comparison with the dry season of 1923, indicating that the variety is much more susceptible under dry conditions.

The production was low on some soils, but very good on others. On gravelly sandy soils, and sandy soils with shallow clay subsoils, the yields were sometimes large and the size and shape of the potatoes quite uniform. On deep sandy soils, the production was poor and the potatoes were mostly deep-rooted and of the "jumbo" size. In the hot-air plant-bed, the potatoes sprouted poorly, and sometimes the sprouts were not rooted well. Since it is one of the moist type of sweet potato, this variety is not likely to be so profitable as some of those already discussed in this bulletin.

TABLE 8

Some Results of Testing the Pumpkin Variety

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Marlton ..... | 1.7 | .... | .7 | .... | 152 | .... |
| Moorestown .. | 7.6 | 52.3 | 5.2 | 18.1 | 112 | 114 |
| Pleasantville .. | 0 | .... | 0 | .... | 270 | .... |
| Vineland ..... | 12.8 | 18.0 | 10.6 | 8.4 | 322 | 226 |
| Berlin ..... | .... | 35.2 | .... | 20.4 | .... | 151 |
| Riverton ..... | .... | 21.1 | .... | 13.5 | .... | 304 |
| College Farm.. | 0 | 0 | 0 | 0 | 233 | 233 |

Fig. 6. Triumph

**The Triumph Variety**

The Triumph (fig. 6) was tested on six farms in 1922 and on seven farms in 1923. The results of the tests (table 9) show that the variety is very resistant to stem rot. There was no infection in the wet season of 1922. The slight infection in 1923 indicated that a dry season is more favorable for the disease than a wet season. There was some irregularity in the production of this variety on the different farms, but the yields were fairly good, and in some cases were high. On light sandy soils, with shallow gravel to clay subsoils, the production of the Triumph was good, and the potatoes were uniform in size and shape, but occasionally somewhat long. On deep and heavy sandy soils the potatoes were not uniform in size and shape, but were long, rough and usually small.

In the hot-air plant-beds, as well as the manure-heated beds, the Triumph potatoes produced many strong, well rooted sprouts. In the field the sprouts were resistant to drought and grew well during a dry season. In 1923 on soils where the stand of the Jersey varieties was difficult to maintain on account of the dry weather during or after resetting, it was easy to obtain a good stand of the Triumph. The sprouts started growth quickly in the field. These results indicate that there may be some relation between the resistance to disease and the ability of the sprout to resist drought injury.

The Triumph is slightly bushy, having short vines, and can be cultivated much longer than the long-vine type without the extra cost of turning the vines. When sprouts were set 15 to 20 inches in rows 2½ feet apart, the crop was easily cultivated.

TABLE 9

Some Results of Testing the Triumph Sweet Potato

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Marlton ..... | 0 | .... | 0 | .... | 217 | .... |
| Moorestown .. | 0 | 0 | 0 | 0 | 412 | 195 |
| Vineland ..... | 0 | 0 | 0 | 0 | 486 | 300 |
| Wolfert ..... | .... | 4.1 | .... | 0 | .... | 343 |
| Repaupa ..... | 0 | .... | 0 | .... | 212 | .... |
| Pleasantville .. | 0 | 0 | 0 | 0 | 368 | 126 |
| Berlin ..... | .... | 6.4 | .... | 0 | .... | 143 |
| Riverton ..... | .... | 2.0 | .... | 0 | .... | 328 |
| College Farm.. | 0 | 0 | 0 | 0 | 265 | 261 |

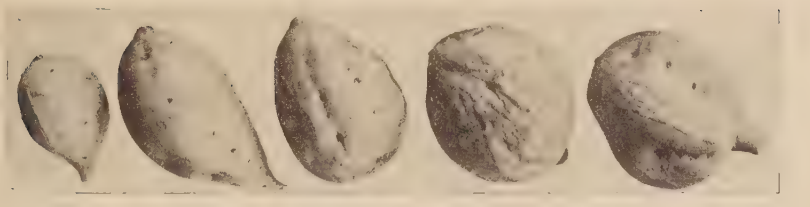

FIG. 7. WHITE YAM

**The White Yam Variety**

The White Yam (fig. 7) was tested on four farms in 1922 and on the same number in 1923. According to the results in table 10 the variety was immune in both wet and dry seasons, as there was no infection or kill due to stem rot in any of the tests (fig. 8). The soils on some of these farms is severely infected, as indicated by a very high percentage of kill of the Jersey varieties. Although immune to the disease in the field, slight infection was obtained by growing the variety in the greenhouse where the temperature was high, and the soil sometimes dry. The production was somewhat greater in the dry season of 1923 than in the wet season of 1922. In both years, however, the yields were high in all tests, and the size and shape of the potatoes was very uniform. In a few tests there were some "jumbo-size" potatoes. At Wolfert a few potatoes in 21 bushels weighed 4 pounds each, but there was less than one ⅝-bushel basket of the large "jumbo" size and less than ½ bushel below the marketable grades. On the College Farm, 48 hills produced 210 salable or marketable-size potatoes, an average of 4.4 potatoes per hill. At Blue Anchor, the average number of salable potatoes was 3.9 per hill and at Wolfert 8.3 per hill.

In the plant-bed the White Yam sprouted well, giving strong and well rooted sprouts. In the field the sprouts were resistant to drought, and the plants grew well during dry weather. The rankness of vine growth also prevented weeds and grass from developing as they did on adjacent parts of the same field where the Yellow Jersey strains were killed by stem rot. In storage, the potatoes kept well and were more resistant to storage rots than some of the Jersey varieties.

When baked, the White Yam is of light yellow flesh, slightly dry, and quite firm. The skin is cream-colored, and the surface is often, but not always, veined.

In view of the splendid results with this variety, it is suggested as the best one to grow on infected soils where the Jersey varieties cannot be grown at a profit. It may be grown either as an early or as a general crop. In either case it is advisable to set the plants 15 to 20 inches apart in the row, for planting at this distance gave potatoes of more uniform size and shape than when planted at 24 to 30 inches.

TABLE 10

Some Results of Testing the White Yam Sweet Potato

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Vineland ..... | 0 | 0 | 0 | 0 | 361 | 425 |
| Wolfert ..... | .... | 0 | .... | 0 | .... | 597 |
| Pleasantville .. | 0 | 0 | 0 | 0 | 405 | 548 |
| Blue Anchor .. | 0 | .... | 0 | .... | 408 | .... |
| College Farm.. | 0 | 0 | 0 | 0 | 412 | 420 |

### The Red Brazil Variety

The Red Brazil variety was tested on four farms in 1922 and on three in 1923. The results are given in table 11. The variety was immune to the disease where it was tested and the production was very good. A high stem-rot kill of the Jersey strains showed that the soils were severely infected on some of the farms.

In the hot-air plant-beds the Red Brazil potatoes gave large and well rooted sprouts. The vines grew rapidly, making it possible to obtain marketable potatoes of good size as early as September 1. The potatoes were irregular in size and shape, being rough, knotty and mostly of "jumbo" size. In storage they kept very well, and were more resistant to the storage diseases than the Jersey varieties.

The Red Brazil is grown in some localities in patches for the early trade of local markets, where the raw potato brings the top price. In some cases as early as September 1 the large potatoes were "graveled"[1] from patches of Red Brazil and sold, leaving the vines on the field to mature, the small potatoes beginnning to develop about that time. It is quite evident that this variety, though very resistant to stem rot, will not be as valuable as some of the preceding ones, because of the rough, knotty and irregular size and shape.

TABLE 11

Some Results of Testing the Red Brazil Sweet Potato

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Blue Anchor .. | 0 | .... | 0 | .... | 210 | .... |
| Pleasantville .. | 0 | 0 | 0 | 0 | 483 | 225 |
| Vineland ..... | 0 | 0 | 0 | 0 | 375 | 231 |
| College Farm.. | 0 | 0 | 0 | 0 | 350 | 535 |

### The Dahomey Variety

The Dahomey was tested on three farms in 1922 and only one in 1923. Table 12 gives the results. While the variety was not attacked by stem rot and although the yield was large on some farms, the potatoes were very irregular in shape and size, being long, crooked, and of very poor grade. On infected soils it was easy to produce and maintain a good stand of the Dahomey variety, but the quality of the potato was much inferior to that of the other resistant varieties here discussed.

TABLE 12

Some Results of Testing the Dahomey Sweet Potato

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Blue Anchor .. | 0 | .... | 0 | .... | 100 | .... |
| Pleasantville .. | 0 | .... | 0 | .... | 257 | .... |
| Vineland ..... | 0 | 0 | 0 | 0 | 433 | 142 |

[1]Individual potatoes pulled from vines before entire hill is harvested.

### The Possibility of Developing Resistant Strains of the Jersey Varieties

In New Jersey, a small acreage is planted in Red Jersey, Gold Skin and Big Stem Jersey varieties. The Large Stem Jersey strains are apparently intermediate between the Yellow Jersey and Big Stem Jersey varieties since they produce smaller vines and potatoes than the Big Stem Jersey grown in Virginia, and are larger than the common Yellow Jersey. In this state, also they produce potatoes that are chunky, round, and of rather uniform shape and size (fig. 8). In some fields, however, where the plants were grown 15 to 20 inches apart, in rows 2½ to 3 feet apart, the potatoes were very similar to the smallest Yellow Jersey strains.

Fig. 8. Test of Different Varieties

The White Yam variety is shown in the center. The Triumph is shown on the left. All vines of both varieties are healthy. On the right is the susceptible Yellow Jersey, showing more than 50 per cent stem-rot infection, July 9, 1924

More than 80 per cent of the land used for sweet potatoes is planted in Yellow Jersey strains. There are so many names for strains of this variety that it will require some time to determine which are similar and which are different. In the literature on the development of sweet potatoes, there is only casual mention of the possibility of varietal development, yet in the north temperate zone there are more than 15 recognized varieties grown for commercial purposes, and in addition there are many other useful strains and varieties grown for local consumption. In New Jersey, there are the Big Stem Jersey, the Gold Skin, the Red Jersey, and the Yellow Jersey varieties. Their home is New Jersey, Delaware, Maryland, and Virginia, where they rarely bloom and are not known to produce fertile flowers. It is quite possible, judging from the following facts,

that these are not all true varieties after all, but are root sports. The Gold Skin, on some soils, is sometimes hard to distinguish from the Yellow Jersey strains. The Vineless Yellow Jersey, sometimes called the "Vineland Bush," as a pure vineless type would be recognized as distinct and separate from any other variety but it sometimes loses its short vine characteristics and develops long runners like any other Yellow Jersey. The potatoes also are similar to those of any other Yellow Jersey and the leaves and other general characters of the vineless strain are very similar to those of the vine type. The only prominent distinction of the vineless from any other Yellow Jersey strain is the bushy growth of the vines which develop by short nodes while the common Yellow Jersey produces long and spreading vines.

On the farm of the Atlantic County Home at Pleasantville, Harry McConnell selected from among his Yellow Jersey variety a strain of sweet potatoes which he named the Atlantic White. For the past three years tests have been conducted with this strain on several farms, and in every case it has remained pure. From field observations there appeared to be little or no distinction between the vine characteristics of this strain and of the Yellow Jersey strains. The potatoes of the White Strain, however, were distinctly different from the Yellow Jersey. They were pinkish to creamy white, smooth-skinned, small and somewhat long. When baked, they were slightly more moist than the other Jersey strains. In this state, the potatoes of the common Yellow Jersey are light yellow to dirty yellow, small to medium, and chunky to long. It is sometimes difficult to distinguish between some of the strains of the Yellow and Big Stem Jersey varieties.

In view of the importance of these varieties in the state, and their variation in susceptibility to stem rot, an effort was made to develop strains by selection. In 1922 and 1923, strains of the Jersey varieties were collected from different localities of the state and tested on infected soils, with the object of determining first the comparative resistance or susceptibility of the strains to stem rot, second, the yields, and third the likeness and other distinguishing characteristics of the different strains. The methods of procedure were similar to those already described. The plant beds and experimental fields were the same as were used for testing the varieties. Potatoes were selected from healthy vines in fields where there was more than 80 per cent infection. When sprouts were grown from the selected potatoes, and set in infected soils, there was just as much stem-rot infection and kill as was present in the field from which the selection was obtained. Although some few plants of the Yellow Jersey strains may not be attacked by stem rot, sprouts from potatoes on these hills are attacked when planted in infected soil. All the strains of Jersey varieties are attacked by stem rot, but they are not equally susceptible.

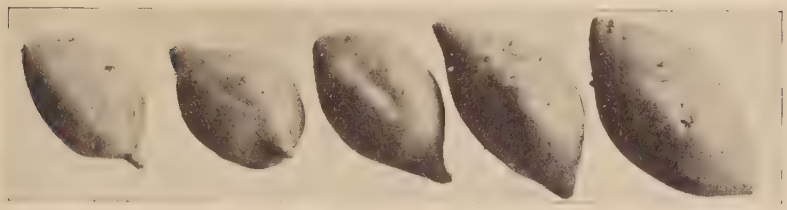

FIG. 9. JERSEY SELECTION 102

In this publication, only the relative resistance of the strains to stem rot and the comparative yields on infected soils are discussed. A good many so-called strains of the Yellow Jersey variety were tested, but only the outstanding and distinct ones are discussed. Each strain is treated individually at first, and later compared with other strains and varieties in the general discussion.

### Jersey Selection 102

This strain (fig. 9) was obtained from the Yellow Jersey variety on the farm of William Liepe, of Atlantic County. Selections were also made on Wilbur Becket's farm at Swedesboro. It is widely grown in this state, because it is, perhaps, the best one for producing fancy potatoes, and is variously known as the "Cedarville," the "Little Up-river," the "Little Stem Jersey" and many other names.

The strain was tested on seven farms in 1922 and on the same number in 1923. The results of the tests are given in table 13. The stem-rot infection and kill were very high on many of the farms. There was some variation in the infection of the plants due to differences in soil infection. On the College Farm there was no infection or kill, indicating that the soil was not infected. The small yields obtained on some of the severely infected soils showed that the production was reduced by the disease. It was evident, however, that some soils were more productive than others, whether infected or not, so that some of the yield variations must be attributed to soil differences and not entirely to the influence of stem rot.

TABLE 13

Some Results of Testing Jersey Selection 102

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Repaupa ..... | 78.1 | .... | 30.0 | .... | 135 | .... |
| Marlton ..... | 64.7 | .... | 21.4 | .... | 89 | .... |
| Moorestown .. | 78.8 | 85.4 | 30.8 | 30.3 | 111 | 31 |
| Vineland ..... | 70.7 | 76.0 | 50.0 | 62.2 | 217 | 120 |
| Wolfert ..... | 67.8 | 85.3 | 37.1 | 65.1 | 108 | 124 |
| Pleasantville .. | 30.0 | 10.6 | 6.0 | 8.0 | 345 | 173 |
| Berlin ..... | .... | 33.8 | .... | 12.9 | .... | 154 |
| Riverton ..... | .... | 83.0 | 0 | 35.1 | .... | 184 |
| College Farm.. | 0 | 0 | 0 | 0 | 298 | 215 |

The potatoes of this selection are small, chunky and of dirt yellow color (fig. 9). On different soils, the colors of the skin and the shape of the potatoes vary slightly. On soils where it is not severely attacked by stem rot, it is a very profitable strain, the uniformity of size, shape, and color being a very desirable quality. The strain is very susceptible to storage rots, but in good sanitary storage houses the potatoes kept well. They sprouted well in both manure and hot-air plant-beds. In the field, the sprouts, though well rooted, were not resistant to drought.

### Jersey Selection 108

The Jersey Selection 108, sometimes called the Atlantic White, was obtained from Harry McConnell, of Atlantic County. In 1922 and also in 1923 it was tested on three farms, with the results given in table 14. The tests showed that the strain is very susceptible to stem rot, the heavy infection and kill causing a very low production. The strain is very prolific in the number of potatoes, but they are generally small, long and white, the larger portion being smaller than marketable stock. For the canning of whole potatoes, this strain might be very desirable.

The potatoes sprouted well in the plant-beds, and in the field the sprouts rooted well, but were not resistant to drought. The potatoes kept well in storage.

TABLE 14

Some Results of Testing Jersey Selection 108

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Blue Anchor... | 62.9 | .... | 48.3 | .... | 101 | .... |
| Vineland ..... | 85.0 | 85.0 | 65.2 | 65.1 | 112 | 77 |
| Pleasantville .. | .... | 36.0 | .... | 26.2 | .... | 52 |
| College Farm.. | 0 | 0 | 0 | 0 | 215 | 164 |

### Jersey Selection 103

Jersey Selection 103 is from the Red Jersey. The selection was tested on six farms in 1922 and on eight in 1923. The results in table 15 show that the percentage of infection and kill was worse in the dry season of 1923 than in the wet season of 1922. It is interesting to study the results obtained at Vineland, where the strain was planted in the same row both seasons. The results would seem to indicate that stem rot caused a reduction in yield of over 400 bushels, but, as was pointed out in table 1, the production was affected also by the dry weather. In spite of the high stem-rot kill on some farms, there was a good production of salable potatoes. On other farms there was a low stem-rot kill and also a low yield. From the above results it is evident that this strain is more productive in a wet than in a dry season, especially on soils where there is slight or no stem-rot kill. Also, in this state, on most any sandy soil where the disease has not previously caused heavy loss, Selection 103 is apt to be very productive of marketable potatoes. In the hot-air and manure-heated plant-beds, the potatoes produced many well rooted sprouts. In the field the sprouts were not resistant to drought, because of the large leaf area. In most sandy soils, the potatoes were chunky,

round but occasionally somewhat long. On soils of neutral reaction, the color was light red, while on soils slightly acid it was deeper red. In most storage houses in the state, the potatoes kept well, but the small potatoes were very susceptible to shrinkage, especially at temperatures above 55° Fahrenheit.

TABLE 15

Some Results of Testing Jersey Selection 103

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Marlton ..... | 35.8 | .... | 14.8 | .... | 165 | .... |
| Moorestown .. | 42.5 | 85.4 | 19.6 | 31.9 | 117 | 102 |
| Blue Anchor... | 75.0 | 100.0 | 65.5 | 85.0 | 271 | 60 |
| Vineland ..... | 38.0 | 73.0 | 9.0 | 65.8 | 507 | 91 |
| Wolfert ..... | .... | 95.1 | .... | 77.6 | .... | 99 |
| Pleasantville .. | 32.0 | 29.3 | 20.0 | 15.2 | 329 | 68 |
| Berlin ..... | .... | 44.0 | .... | 11.8 | .... | 176 |
| Riverton ..... | .... | 88.0 | .... | 38.5 | .... | 155 |
| College Farm.. | 0 | 0 | 0 | 0 | 337 | 251 |

TABLE 16

Some Results of Testing Jersey Selection 104—Season of 1923

| Locality | Stem-Rot Infection | Stem-Rot Kill | Yield per Acre |
|---|---|---|---|
| | *per cent* | *per cent* | *bushels* |
| Wolfert ..... | 73.6 | 67.8 | 125 |
| Vineland ..... | 30.0 | 20.2 | 132 |
| Riverton ..... | 42.8 | 10.4 | 76 |
| Berlin ..... | 30.1 | 11.9 | 148 |
| Moorestown ... | 50.5 | 8.9 | 62 |
| Pleasantville .. | 12.0 | 2.5 | 140 |
| College Farm.. | 0 | 0 | 232 |

### Jersey Selection 104

Selection 104 (fig. 10) was obtained from the Vineless Yellow Jersey, on the farm of Henry Karn, of Burlington County, and was tested on seven farms in 1923. According to the results in table 16, the percentages of stem-rot infection and kill were quite high on many farms. On other farms the infection was high, but the kill was low. This was probably due either to mild infection during the summer or to a high percentage of late infection, which was not advanced far enough to kill the vines before harvest in October. The yields were low on most farms, and the potatoes were very irregular in size and shape. It is evident that the variety does not do well in dry seasons. However, on the farm where the selection was made in 1922, the yield was more than 250 bushels per acre on a light sandy soil.

In the plant-bed the potatoes sprouted well, but the sprouts were sometimes very small and did not grow rapidly at first. The short bushy vines (about 2 feet long)

were easily cultivated without turning, as is necessary with other strains. The potatoes were uniform in shape and size, being round to oval, and conformed with Jersey grades 1 and 2. The keeping qualities in storage were as good as those of the other Jersey strains.

In small areas in Gloucester, Salem and Burlington counties, the Vineless strain is grown for both home and commercial use. In dry seasons after cultivation is discontinued, the vine growth is sometimes not heavy enough to keep down the development of crab-grass and weeds.

Fig. 10. The Vineless Yellow Jersey from which Selection 104 was Obtained

### Jersey Selection 116

Jersey selection 116 was obtained from a strain known as Gold Skin, and was tested on five farms in both 1922 and 1923. Some results are given in table 17. On none of the farms was there a serious infection and kill due to stem rot, although the strain was tested on farms where other Jersey strains were nearly destroyed. There was a fairly good production on all farms, which indicates that the strain was very well adapted to all the soils on which it was tested, though it did better on some soils than others, and was more productive in the wet season of 1922 than in the dry season of 1923.

The potatoes produced by this strain are chunky and round to somewhat long. The skin and flesh are of a somewhat deeper orange to gold color than the Yellow Jersey strains, and in some sandy soils the skin is of a deeper gold color than in heavier soils. In storage the potatoes dry out to a greater extent than other Jersey strains; the shrinkage is generally most serious at the stem end. In the hot-air plant-beds, the potatoes which are permitted to dry out in storage are very poor producers of sprouts. Good sound potatoes, not showing much loss of weight due to shrinkage, sprout well in both hot-air and manure-heated beds. This is an excellent strain to grow where the crop is sold immediately or soon after it is harvested. Although some growers are sure to be successful in storing it, many will lose from storage except where the temperature is maintained at or near 55° Fahrenheit and the relative humidity at or near 68 per cent.

TABLE 17

Some Results of Testing Jersey Selection 116

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Marlton ..... | 1.1 | .... | 0 | .... | 193 | .... |
| Vineland ..... | 23.0 | 16.0 | 4.1 | 12.2 | 523 | 186 |
| Blue Anchor.. | 23.1 | .... | 13.4 | .... | 457 | .... |
| Moorestown .. | 7.7 | 25.0 | 2.7 | 12.6 | 355 | 187 |
| Riverton ..... | .... | 32.0 | .... | 14.6 | .... | 328 |
| Berlin ..... | .... | 27.0 | .... | 11.8 | .... | 176 |
| College Farm.. | 0 | 0 | 0 | 0 | 285 | 215 |

**Jersey Selection 105**

Jersey selection 105 (fig. 11), which was obtained from F. E. Priestly of Camden County, is grown in many other localities. It is very likely an intermediate strain of the smallest and largest strains of the Jersey varieties. It was

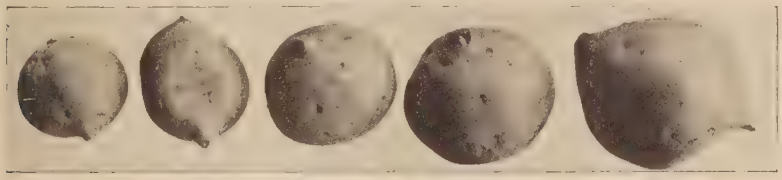

FIG. 11. JERSEY SELECTION 105.

tested on five farms in 1922 and on seven in 1923, with the results given in table 18. There was a big variation in the percentage of infection and kill in this strain due to stem rot. On some farms the percentage of infection was very high, but on none was the kill very high. The yields also were good on all farms, giving some indication of the value of the strain.

TABLE 18

Some Results of Testing Jersey Selection 105

| Locality | Stem-Rot Infection | | Stem-Rot Kill | | Yield per Acre | |
|---|---|---|---|---|---|---|
| | 1922 | 1923 | 1922 | 1923 | 1922 | 1923 |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* | *bushels* |
| Wolfert ..... | 12.6 | 72.1 | 1.6 | 17.7 | 350 | 240 |
| Vineland ..... | .... | 40.2 | .... | 13.6 | .... | 285 |
| Riverton ..... | .... | 25.6 | .... | 15.1 | .... | 284 |
| Blue Anchor.. | 23.1 | .... | 9.1 | .... | 402 | .... |
| Moorestown .. | 14.5 | 18.4 | 6.5 | 6.0 | 335 | 195 |
| Repaupa ..... | 25.3 | .... | 2.0 | .... | 238 | .... |
| Berlin ..... | .... | 25.1 | .... | 10.1 | .... | 170 |
| Pleasantville .. | .... | 3.6 | .... | 1.3 | .... | 135 |
| College Farm.. | 0 | 0 | 0 | 0 | 428 | 314 |

The potatoes are round to turnip-shaped, and the skin tends to be cream-colored rather than dirty yellow like that of some of the other Jersey strains. In size and shape the potatoes are very uniform and of excellent market type. When the plants are grown 15 to 20 inches apart in the row, the potatoes are smaller and the size and shape more uniform than if grown farther apart. In storage the potato generally keeps well, but in some houses it seems to shrink severely.

## Discussion of Results of Tests Conducted With Strains and Varieties of Sweet Potatoes

Since the results given in the preceding tables showed that there was a variation in both stem-rot infection and kill, and also in the yield on the various farms, and since all strains and varieties were not tested on the same farms, averages of all the results cannot be used properly to compare one variety or strain with another. In order better to show a comparison, results obtained on infected soils on three farms in 1923, where all the strains and varieties discussed were grown side by side, are averaged. Because of the poor marketing qualities of the Pumpkin and Dahomey varieties they are not included in this discussion. The total percentages of infection in July, in August, and in October when the potatoes were harvested, are given in table 19, as well as the total kill and the yield. The results show that infection is apt to take place any time during the growing season, some strains being more severely attacked in the

TABLE 19

A comparison of results of testing some strains and varieties of sweet potatoes on infected soils on three farms

| Variety | Total Stem-Rot | | | | Yield per Acre |
|---|---|---|---|---|---|
| | Infection in July | Infection in August | Infection in October | Kill | |
| | *per cent* | *per cent* | *per cent* | *per cent* | *bushels* |
| White Yam | 0 | 0 | 0 | 0 | 523.6 |
| Red Brazil | 0 | 0 | 0 | 0 | 302.9 |
| Triumph | 0 | 0 | 2.0 | 0 | 324.1 |
| Dooley | 5.0 | 13.0 | 27.2 | 10.5 | 176.7 |
| Jersey S. 116 | 3.4 | 9.4 | 24.3 | 13.1 | 233.5 |
| Jersey S. 105 | 6.9 | 13.0 | 45.9 | 15.4 | 269.6 |
| Porto Rico | 6.8 | 26.9 | 40.5 | 25.9 | 157.8 |
| Nancy Hall | 5.2 | 21.1 | 42.7 | 27.6 | 143.1 |
| Jersey S. 104 | 9.8 | 16.5 | 51.7 | 32.8 | 111.1 |
| Jersey S. 108 | 11.0 | 23.3 | 61.3 | 46.5 | 77.1 |
| Jersey S. 102 | 25.5 | 44.9 | 81.4 | 54.1 | 122.3 |
| Jersey S. 103 | 24.0 | 48.6 | 85.4 | 60.6 | 115.0 |

early part of the season than others. Plants infected with stem rot in July and August, in most instances, died before harvest. However, a large percentage of the plants that became infected in the latter part of August and September produced a fair crop, but on some of these there were more and smaller potatoes produced than on healthy plants. Infection in July and August, therefore, is more likely to result in a serious reduction in yield than infection in late August or September. Although the

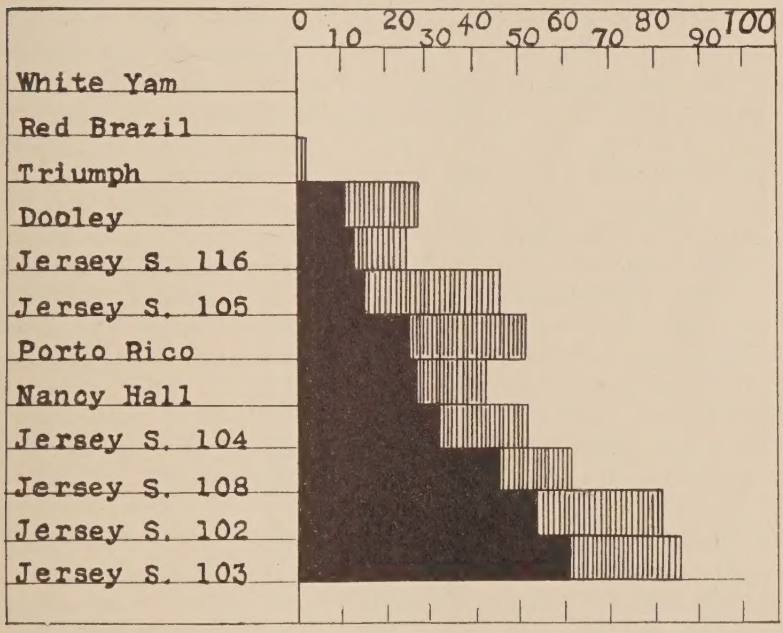


FIG. 12. DIAGRAM SHOWING SUSCEPTIBILITY OF DIFFERENT VARIETIES AND STRAINS OF SWEET POTATOES TO STEM ROT

Dark portion represents percentage of kill, shaded portion percentage of infection not killed.

yields of the different varieties and strains vary on soils where there was no infection, the results indicate that stem rot was the cause of a heavy reduction in yield, particularly in the case of some of the very susceptible Jersey strains.

The average results of stem-rot infection and kill are given graphically in figure 12.

As a result of these tests some suggestions given below and reasons supporting them are believed to be the best guide for the growers in New Jersey for the prevention of losses from stem rot. A very large percentage of the soils used for growing sweet potatoes are known to be severely infected. On nearly every farm where sweet potatoes have been previous-

ly grown, the owner has some knowledge of the most severely infected areas, as well as the slightly infected ones. Although a fair crop is sometimes produced on infected soils, even where the very susceptible Jersey strains are grown, it is not wise to take such a chance with these strains. On soils known to be severely infected and on which the very susceptible Jersey strains are a failure, there are three things that can be done.

In the first place, the immune or nearly immune varieties can be planted. The White Yam, Triumph and Red Brazil varieties are recommended because they are adapted to most of the sweet potato soils of the state. It is advisable first to test these varieties on a small scale to determine if they are adapted to the particular type of soil on the farm where they are to be used, inasmuch as the size and shape of the potatoes of some varieties are more uniform on some soils than on others. In testing the varieties it is advisable also to vary the distance between the rows and hills, because where the hills are 15 to 20 inches apart there will be less of the "jumbo" sizes than where spaced at 2½ feet or more. In this state, in local and in nearby markets, the Triumph, White Yam and Red Brazil potatoes are not yet well established. Temporarily limiting the growing of these varieties to the most severely infected areas, will help to hold production in keeping with the demand. If later the demand should increase—which is likely because the three varieties are equal in quality to the Jerseys—the production could then be increased. The important step now is to develop by cultural methods the size and shape of these varieties in accordance with the wishes of the dealers and their customers. Of the three, the White Yam is the most promising variety.

Second, it is advisable to grow resistant strains of the Jersey varieties on slightly infected soils, for often satisfactory yields result, even though 10 to 20 per cent of the plants may be killed by the disease. The main reason for planting the resistant Jersey strains is the market demand which is well established and extends throughout the year. Planting the resistant Jersey strains as suggested here will allow a gradual development of the Triumph, White Yam and other similar varieties. This should tend to maintain the price level for all other varieties.

Finally, where none of the immune and resistant varieties are satisfactory on infected soils, it is advisable to plant some other crop. Other crops grown successfully on stem-rot infested soils include grasses, alfalfa, corn, asparagus, melons, tomatoes, peppers, peaches and apples, none of which are known to be susceptible to the organisms that cause the stem rot of sweet potatoes. In many infected fields observed, none of the plants cited above showed any signs of being attacked.

There are a number of growers in the state who have similar strains to those described. Tests are to be continued to determine the relations of other strains to the ones already mentioned.

## Summary

1. In this state the annual production of sweet potatoes is approximately 2,000,000 bushels. The loss due to stem rot is estimated to be more than 400,000 bushels, valued at $500,000. The disease is serious in many states, especially where the Nancy Hall and Jersey varieties are grown, and is worse in dry than in wet seasons.

2. The seed potatoes and the soils in both hot-bed and field are important sources of infection. In tests with diseased and healthy sweet potatoes the diseased sprouts, slips or plants drawn from potatoes selected from heavily infected areas amounted to 35 to 52 per cent, and from slightly infected areas 7.0 to 9.0 per cent, but from areas free from infection, there was none.

3. The soil is the most important source of infection. On seven farms, with sprouts grown in one plant-bed from the same lot of Jersey Selection 102, which was selected in a field showing very little stem-rot, the infection was 0, 8.6, 33.8, 85.4, 83.0, 85.3 and 100.0 per cent, respectively. On infected soils a very large percentage of cuttings made from healthy vines also were killed by stem rot.

4. The Dahomey, Red Brazil, White Yam, and Triumph varieties were very resistant to stem rot. When set in infected soils, sprouts of none of these varieties were killed by the disease, but at digging time a small percentage of the Triumph was infected. The White Yam, Red Brazil and Triumph varieties are recommended, the White Yam being considered the best. These three varieties are well adapted to the climate and soil conditions in this state. The Porto Rico, Nancy Hall and Dooley varieties were only slightly resistant to stem rot.

5. There are many sport strains of Jersey varieties, some of which are distinguishable from each other by vine length, leaf size, color of skin, size and shape of the potato. Some of the strains are more resistant than others. On infected soils, the selections 105 and 116 were infected, but the kill was very small, and the yield was profitable on all test farms. On the same farms and soils, selections 102, 103 and 108 were severely attacked and a large number of plants killed by stem rot, resulting in very low and unprofitable production.

6. The above results prompt the recommendations offered below. Before planting any variety on a large scale the first year it should be tested in a small way to determine the rate of production and quality of potatoes on the soil type where it is to be used.

(a) On soils where the disease has not been observed and on very slightly infected soils, any of the Jersey varieties previously found to be profitable are recommended. Where there is a demand for so-called Yam sweet potatoes, the Nancy Hall, Porto Rico and Dooley varieties may be grown profitably.

(b) On other infected soils, where the stem-rot kill does not exceed 15 per cent, certified seed of the more resistant strains of Jersey varieties is recommended until the demand in local and nearby markets for the varieties recommended in (c) is greatly increased.

(c) On severely infected soils, it is recommended that the White Yam, Triumph and Red Brazil varieties should be used.

(d) On some severely infected soils, especially on deep sandy soils, none of the above recommendations may be satisfactory. In this case, grasses, alfalfa, corn, asparagus, melons, tomatoes, peaches, apples, or other crops may be grown successfully on infected soils.

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